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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/346,194	07/01/1999	KAVIRAJ SINGH	5693P214	2113
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AMIN. TUROCY & CALVIN, LLP 24TH FLOOR, NATIONAL CITY CENTER 1900 EAST NINTH STREET CLEVELAND, OH 44114			EXAMINER TANG, KENNETH	
			ART UNIT 2195	PAPER NUMBER
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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
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09/346194

7/1/99

Kaviraj Singh

5693 P214

EXAMINER

TANG

ART UNIT	PAPER
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2195

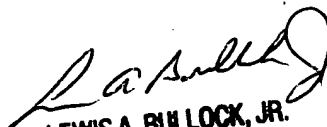
20070201

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Commissioner for Patents

A copy of provisional application No. 60/107,394, filed on Nov. 6, 1998 is disclosed. This provisional application is related to Patent No. 6,405,215 B1 (Yaung) that was referenced by the Examiner in the Final Rejection dated 1/30/07.

  
LEWIS A. BULLOCK, JR.  
PRIMARY EXAMINER

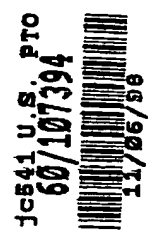
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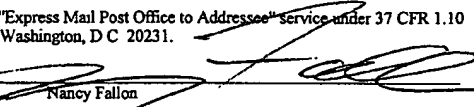
11/06/98



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POCKET NUMBER
ST9-98-117



<b>CERTIFICATE UNDER 37 CFR 1.10</b> "Express Mail" mailing label number: EMS02997891US Date of Deposit: November 6, 1998  I hereby certify that this paper or fee is being deposited with the U S Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to Assistant Commissioner for Patents, Washington, D C 20231.  By:  Name: Nancy Fallon	
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REQUEST FOR PROVISIONAL APPLICATION UNDER 37 C.F.R. § 1.53(b)(2)

BOX PROVISIONAL PATENT APPLICATION  
 Assistant Commissioner for Patents  
 Washington, DC 20231

Dear Sir:

This is a request for filing a Provisional application for patent under 37 CFR § 1.53(b)(2) entitled WORKFLOW AGENT FOR A MULTIMEDIA DATABASE SYSTEM by the following inventor(s):

Full Name Of Inventor	Family Name Yaung	First Given Name Alan	Second Given Name Tsu-I
Residence & Citizenship	City San Jose	State or Foreign Country California	Country of Citizenship United States of America
Post Office Address	Post Office Address 1137 Queensbridge Way	City San Jose	State & Zip Code/Country California 95120/U.S.A.
Full Name Of Inventor	Family Name	First Given Name	Second Given Name
Residence & Citizenship	City	State or Foreign Country	Country of Citizenship
Post Office Address	Post Office Address	City	State & Zip Code/Country
Full Name Of Inventor	Family Name	First Given Name	Second Given Name
Residence & Citizenship	City	State or Foreign Country	Country of Citizenship
Post Office Address	Post Office Address	City	State & Zip Code/Country

- ☒ Enclosed is the Provisional application for patent as follows: 19 pages of specification, and 6 sheets of drawings.
- ☐ A Verified Statement that this filing is by a small entity (37 CFR 1.9, 1.27, 1.28) is attached.
- ☒ Payment of Provisional filing fee under 37 C.F.R. § 1.16(k) :
  - ☒ Attached is a check in the amount of \$ 150.
  - ☐ Please charge Deposit Account No. 13-2724.
  - ☐ PAYMENT OF THE FILING FEE IS BEING DEFERRED.
- ☒ The Commissioner is hereby authorized to charge any additional fees as set forth in 37 CFR §§ 1.16 to 1.18 which may be required by this paper or credit any overpayment to Account No. 13-2724.

5. ☐ Enclosed is an Assignment of the invention to \_\_\_\_\_, Recordation Form Cover Sheet and a check for \$ \_\_\_\_\_ to cover the Recordation Fee.
6. ☐ Also Enclosed:
7. ☐ The invention was made by the following agency of the United States Government or under a contract with the following agency of the United States Government:
8. ☒ Address all future communications to the **Attention of Janaki Komanduri** (may only be completed by attorney or agent of record) at the address below.
9. ☒ A return postcard is enclosed.

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By: *Denise L. McKenzie*  
Denise L. McKenzie  
Reg. No. P-43-790

## WORKFLOW AGENT FOR A MULTIMEDIA DATABASE SYSTEM

### PROBLEM SOLVED

Workflow management is an essential element in today's enterprise data processing. IBM Digital Library, a multimedia database system, provides the workflow capability through a set of workflow-related APIs (Application Programming Interfaces). However, it has certain deficiencies: (1) lack of workflow-based application invocation, and (2) lack of workflow-based event notification. Workflow-based application invocation facilitates the application integration with the workflow logic, while workflow-based event notification facilitates the synchronization between workflow logic and application logic. Without these capabilities, it would be difficult for application developers to deliver sensible workflow applications to their customers. The proposed method provides a solution to solve the problems mentioned above. It will enhance the workflow capability of the IBM Digital Library product.

### DETAILED DESCRIPTION OF ONE EMBODIMENT

The proposed method provides an effective approach to managing the workflow in a multimedia database system. It presents a solution that solves the problems of lack of workflow-based application invocation, and lack of workflow-based event notification. The solution is based on a software agent technique. A workflow agent is designed to track the item of interest at a real-time basis. The workflow agent will perform the specified action if certain conditions are met. The workflow agent is autonomous without any user interventions. It provides the enhancements on application invocation capability and workflow-based event notification. This invention will allow application programmers to develop complex workflow applications in the IBM Digital Library product.

Software agent techniques are gaining more attention in recent years. The proposed method applies a software agent technique into the workflow management of a multimedia database system. The workflow agent presented in the invention provides the enhancements on application invocation capability and workflow-based event notification. It is useful in tracking and handling the workflow item of interest in a multimedia database system. This invention will allow application programmers to develop complex workflow applications in the IBM Digital Library product.

The invention provides an alternative solution to workflow-based application invocation for those customers who do not use a general-purpose workflow engine. The integration with a workflow engine may require additional hardware/software resources and training costs. The proposed method is a cost effective approach to workflow application invocation without the overhead introduced by the workflow engine.

The proposed method presents a workflow agent procedure shown in Figure 1. After the workflow agent has started, it will connect to a multimedia database (10). It will then process the input parameters (20) that specify the firing conditions, the expected action, and other restrictions. Input parameters form a workflow rule that is composed of three parts: a condition part, an action part, and a restriction part.

In the current design, the condition part allows the user to specify one or more of the following conditions:

- item ID - the required item ID of the document
- suspension status - indicating the suspension status of the item
- workflow status - indicating the workflow status of the item
- release type - indicating the release criteria of the item
- priority - indicating the priority of the item
- workflow ID - indicating the workflow ID of the containing workflow
- workbasket ID - indicating the workbasket ID of the containing workbasket

The action part contains the expected action for the specified conditions. The action is the name of an executable program (e.g., an application, a command file) with parameters. For example, "E:\Netscape\Communicator\Program\netscape.exe www.yahoo.com" is a valid action.

The restriction part describes zero or more restrictions:

- interval - indicating the interval of checking the conditions and the default interval is 1000 milliseconds
- delay - indicating the delay time of firing the action and the default delay time is 0 millisecond
- wait - indicating whether the workflow agent waits for the termination of the action and the default setting is FALSE

Below is an example for a workflow agent with the input parameters:

- item ID  
Flag: -i  
Value: "EP8L8OR9MH#QES"
- workflow status  
Flag: -w  
Value: 2 meaning "currently in workflow"
- delay  
Flag: -d  
Value: 5000 milliseconds
- wait  
Flag: -t  
Value: 1 meaning TRUE
- interval  
Flag: -v  
Value: 5000 milliseconds
- action  
Flag: -a  
Value: "E:\Netscape\Communicator\Program\netscape.exe www.yahoo.com"

```
wfagent -i "EP8L8OR9MH#QES" -w 2 -d 5000 -t 1 -v 5000  
-a "E:\Netscape\Communicator\Program\netscape.exe www.yahoo.com"
```

flags:

- h help
- i itemID
- s suspension\_status
- w workflow\_status
- r release\_type
- p priority
- f workflowID
- b workbasketID
- d delay
- t wait
- v interval
- a action

Based on the input parameters, the workflow agent will construct a condition pattern (30) that is a vector of binaries indicating the presence of input parameters.

The condition pattern is described in the following:

```
<item ID,  
suspension status,  
workflow status,  
release type,  
priority,  
workflow ID,  
workbasket ID,  
delay,  
wait,  
interval,  
action>
```

<10100001111> is the condition pattern for the example above.

The result pattern is constructed (40) by checking the conditions indicated in the condition pattern. The procedure then checks whether the condition pattern matches the result pattern (50). The result pattern uses the same format of the condition pattern. By following the same example, if the result pattern constructed is <10100001111>, the condition pattern matched the result pattern. Otherwise, they mismatches.

If the condition pattern matches the result pattern (50) and an action is specified (60), the action is fired immediately (62, 66) or with a specified delay (62, 64, 66). The workflow agent disconnects from the multimedia database after the specified action is invoked (80). If no action is specified, the workflow agent also disconnects from the multimedia database (80).

If the condition pattern does not match the result pattern (50) and no interval of checking conditions is specified (70), the default checking period is used (74). If the condition pattern does not match the result pattern (50) and an interval of checking conditions is specified (70), the workflow agent delays the specified period before matching the patterns (72). Both paths go back to the step of constructing the result pattern (40). This forms an infinite loop of checking conditions.



The workflow agent can work well in a client/server environment. Figure 2 shows how multiple workflow agents residing on different workstations interact with a workflow application in IBM Digital Library. A workflow agent can be running on a geographically remote workstation, tracking the specified document item in the server, and invoking an application based on the conditions.

There are four usage scenarios that can demonstrate the use of the workflow agent. They are simulated workflow-based event notification, application invocation without waiting, application invocation with waiting, and stand-alone workflow agent.

#### Scenario 1: Simulated Workflow-Based Event Notification

IBM Digital Library does not provide any workflow-based event notification capability. However as shown in Figure 3, we may simulate this workflow-based event notification through a workflow agent. The workflow application can launch a workflow agent in its logic (step 1). The workflow application is then suspended and waiting for the return of the workflow agent to the synchronization point. The workflow agent will listen to the condition changes of the specified document item. As soon as the specified conditions are met, the workflow agent will return back to the synchronization point of the workflow application (step 2). The workflow application will resume its execution. In essence, this is a simulated workflow-based event notification. The set of conditions that the workflow agent is interested in is a logical workflow-based event.

#### Scenario 2: Application Invocation without Waiting

IBM Digital Library does not provide application invocation capability for workflow-based solutions. The scenario of application invocation without waiting means that a workflow application will invoke another application without waiting for the termination of the invoked application. Figure 4 shows how to achieve application invocation without waiting. The workflow application can launch a workflow agent in its logic (step 1). The workflow application is then suspended and waiting for the return of the workflow agent to the synchronization point. The workflow agent will listen to the condition changes of the specified document item. As soon as the specified conditions are met, the workflow agent will invoke another application (step 2). The workflow agent will return back to the synchronization point of the workflow application (step 3) after the invocation. The workflow application will resume its execution, while the invoked application is still running.

### Scenario 3: Application Invocation with Waiting

IBM Digital Library does not provide application invocation capability for workflow-based solutions. The scenario of application invocation with waiting means that a workflow application will invoke another application with waiting for the termination of the invoked application. Figure 5 presents how to achieve application invocation with waiting. The workflow application can launch a workflow agent in its logic (step 1). The workflow application is then suspended and waiting for the return of the workflow agent to the synchronization point. The workflow agent will listen to the condition changes of the specified document item. As soon as the specified conditions are met, the workflow agent will invoke another application (step 2). The workflow agent will return back to the synchronization point of the workflow application (step 4) after the invoked application has completed (step 3). The workflow application will resume its execution after the invoked application terminates.

### Scenario 4: Stand-Alone Workflow Agent

IBM Digital Library does not provide any stand-alone workflow agent for its users. The scenario of stand-alone workflow agent demonstrates how to use a workflow agent to invoke an application. As shown in Figure 6, a workflow agent is launched from the command line (step 1). The workflow agent will listen to the condition changes of the specified document item. As soon as the specified conditions are met, the workflow agent will invoke another application (step 2). After the invocation, the workflow agent terminates and the invoked application continues its execution.

## **IBM DB2 Digital Library Version 2**

*An end-to-end solution for managing multimedia content.*

- Reach new markets and establish new sources of revenue through improved management and reuse of media assets
- Preserve your assets from physical deterioration
- Protect your assets with advanced rights management
- Consolidate management of text, images, audio and video with easier, faster access
- Save money with electronic delivery
- Be ready for Year 2000

Developed with a variety of key customers and business partners, IBM DB2 Digital Library has helped businesses and institutions in the areas of higher education, media and publishing, entertainment, culture, health, and commerce provide greater access to their digital assets, while enhancing their growth and new revenue opportunities. IBM Digital Library Version 2, building on the strength of these technologies, enables literally petabytes of text, images, audio and video, to be created or transformed into digital form and distributed over any network, with security, to users around the world.

### **New features in Version 2 include:**

- Enhanced platform support now includes Windows NT and Macintosh
- Multi-language development tools
- Enhanced rights management
- Integrated multi-search capability
- Integrated support for IBM media servers
- Java-based system administration interface
- Easier installation with graphical user interface guides
- IBM DB2 Universal Database components

### **Key Features of IBM DB2 Digital Library Version 2**

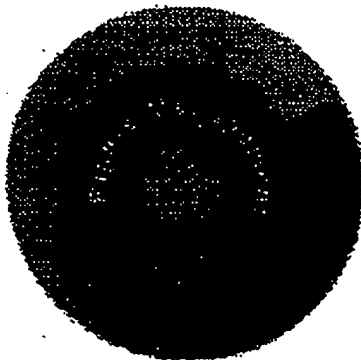
**IBM DB2 Digital Library Architecture**

**IBM DB2 Digital Library at a Glance**

The fundamental market shift from analog to digital has created a new competitive environment that is changing the way business is transacted. From media production groups to print and Web publishers; from research and teaching to distance education; from the fast-paced world of television news to Hollywood studios, it's digital media that is driving the change.

This digital media may be text, full-motion video, audio, graphics, or images. Whatever its form, the challenge is to provide media asset solutions with sufficient storage capacity, scalability, speed, multi-level security, sophisticated searching techniques and Internet access to reach new markets, preserve assets from loss or deterioration, and ensure copyright protection.

IBM DB2 Digital Library integrates the technologies of information capture, storage management, search and retrieval, and secure distribution into a single offering. Only IBM has wrestled with the tough challenges and come up with a solution framework to allow companies to build digital libraries using their choice of client and server platforms; then to distribute their content, with security and intelligent management, to users around the world. Only IBM has the real-world, digital library experience with some of the world's largest media collections, including the Library of Congress, CBS News, the National Palace Museum in Taiwan, the Vatican Library, and the State Hermitage Museum in St. Petersburg, Russia.



For a tour through the functions of IBM DB2 Digital Library, please view one of the sections below:

- Create & Capture
- Storage & Management
- Search & Access
- Distribution
- Rights Management

More information on IBM DB2 Digital Library solutions for Telecommunications & Media, Higher Education, or Government Industries are available online, please visit the appropriate industry.

View a spectrum of creative customer solutions.



## **Key Features of IBM DB2 Digital Library Version 2**

*IBM DB2 Digital Library Version 2 provides a sophisticated end-to-end solution for maximizing the value of multimedia assets. It can be used to create customer-specific solutions in any industry.*

### **Advanced Search:**

NEW! Integrated multi-search capability lets you develop Web-based and desktop IBM DB2 Digital Library applications using APIs in Java, C++, C or Active X that combine catalog and text searches in a single query. A sample Java applet which demonstrates this multi-search capability comes with IBM Digital Library Version 2.

- Search images by color average, distribution, position and image texture
- Search and retrieve documents in multiple languages with support for single and double byte languages
- Fuzzy and phonetic searches
- Ability to search stored objects, including parametric and full text
- Search with Boolean logic by single word, phrase or multiple terms
- Use of natural language when specifying a query
- Relevance ranking of search results
- Clustering of results list

### **Rights Management:**

NEW! Protect your intellectual property with enhanced rights management functions, including watermarking techniques for bi-level and color images, and data hiding for images.

- Extensive and customizable access control that supports secured access to object servers
- Image watermarking using your own unique mark
- IBM plans to support secure content delivery in a future release

### **Access via the Internet:**

NEW! You can use the improved Java-based system administration tool to perform IBM DB2 Digital Library system administration tasks through the Internet or from the desktop.

- Access to the contents of the IBM DB2 Digital Library through Web browsers
- Support for developing new Internet applications using Java applets and APIs for Java, C++, C and Active X.

### **Highly Scalable:**

- Ability to grow from a single workstation to a networked enterprise-wide solution

- Collections can be maintained on a single PC hard drive, then grow to being managed by storage servers containing terabytes or even petabytes of data.
- Use of networked IBM Tape Library and Optical Library units under System Managed Storage control
- Use of RS/6000 configurations with multiple Object Server nodes, fast switching and high availability
- Multiple distributed Object Storage Servers, allowing:
  - the selection of specialized server types that are best suited to the storage and distribution of a particular data type
  - the location of servers to be placed close to users to reduce network demands and improve user response time
  - storage of multiple parts of a single digital asset on different Object Servers

#### **Openness**

**NEW!** Enhanced Platform support means you can now install servers on Windows NT platforms and run clients in the Macintosh environment.

**NEW!** Multi-language development tools help you develop IBM DB2 Digital Library applications which can create, query and update data managed by your IBM Digital Library. They support the use of a variety of APIs, including Java, C++, C and Active X. The applications can access IBM DB2 Digital Library data via the Internet or desktops on the AIX and Windows platforms.

- Content independent storage and distribution of digital assets
- Client/Server design that allows intermixing different platforms within the same solution
- A wide range of heterogeneous clients that can be intermixed as needed
- Interfaces for an organization's existing data distribution methods as well as many popular authoring tools

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IBM DB2 Digital Library Version 2 includes many other new features to help you get the most out of your IBM DB2 Digital Library system.

**NEW!** The award-winning Query By Image Content (QBIC) technology allows you to search for images by color percentages, distribution, position and image texture. And the image search capability may be used with catalog and text searches as part of the integrated multi-search functions.

**NEW!** Integrated digital media object management is available using IBM media servers. The IBM DB2 Digital Library Media Manager works with the IBM VideoCharger Server for AIX product to deliver streaming digital audio and MPEG video objects over the Internet.

**NEW!** IBM DB2 Digital Library Version 2 contains selected components of IBM DB2 Universal Database Version 5 that may be installed and used exclusively to support IBM DB2 Digital Library.

**NEW!** Improved installation is made possible by a graphical user interface which guides you through the installation of IBM DB2 Digital Library quickly and efficiently.

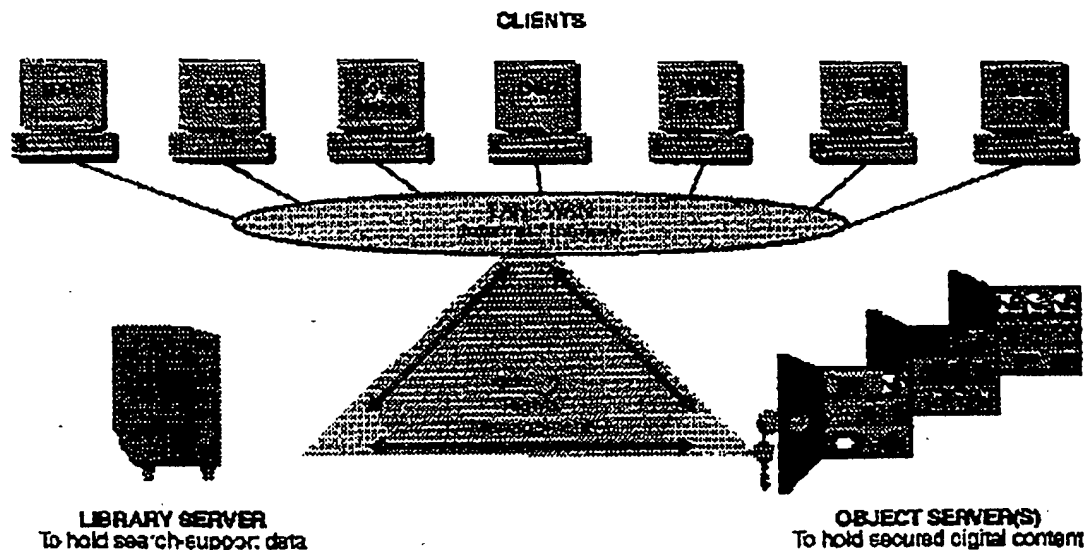
**NEW!** Online help is delivered in HTML to easily view from an included Web browser. Clicking on

help automatically opens the browser and takes you to the appropriate help topic. All the books are available on one CD-ROM and can be printed or viewed online.

NEW! Year 2000 Ready. When used in accordance with its associated documentation, IBM DB2 Digital Library is capable of correctly processing, providing and/or receiving date data within and between the 20th and 21st centuries, provided all other products used with the product properly exchange date data with it.

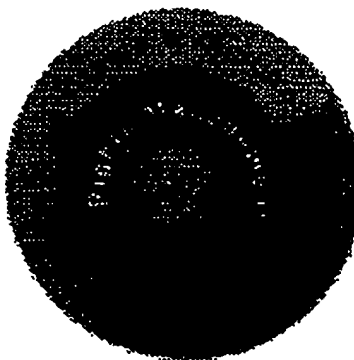
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## IBM DB2 Digital Library Architecture



The IBM DB2 Digital Library architecture is based on a triangular client/server model comprised of a Library Server, one or more multimedia Object Servers, and one or more clients. The core of the infrastructure is the Library Server. The Library Server, using IBM DB2 or Oracle database services, manages the IBM DB2 Digital Library catalog information, locates stored objects using a variety of search technologies, provides secured access to the objects held in the collection, and communicates with the Object Servers. The digital content is stored in Object Servers. Object Servers support the attachment of DASD and other media devices, and can be distributed across an enterprise network to provide convenient user access. The end user, on a client desktop, receives direct access to the information requested from the collection regardless of where the data is stored. Many clients can be connected to the Library and Object Server in an IBM DB2 Digital

Library system, including those accessing the IBM DB2 Digital Library using supported Web browsers.



The five integrated functions of IBM DB2 Digital Library enable the collection, organization, storage and management, protection and distribution of multimedia objects.

### Creation and Capture

Digital content from diverse sources can be incorporated into IBM Digital Library by integrating existing tools or importing information. IBM Digital Library Version 2 supports an array of industry-standard scanners and provides the capability to define and import many data formats. Authoring tools from IBM

and other vendors can be used to create new digital information to be managed by an IBM DB2 Digital Library. Single point-of-entry business application access can be developed using the APIs provided.



## Storage and Management

The distributed design supports a full range of platforms, and provides the flexibility and granularity to add server and client capacity where and when it is needed. Enterprise-wide distributed access to library index information and isolating the client application from the Object Servers provides optimal control and security. Where multiple users require local access to the same data, objects can be cached on Object Servers to improve performance.

IBM DB2 Universal Database technology provides IBM DB2 Digital Library the capability to operate in open, heterogeneous environments delivering industrial-strength levels of integrity, data access, high-volume data management and central-system administration. IBM DB2 Digital Library can also use Oracle database management system for the AIX environment.

## Search and Access

IBM DB2 Digital Library enables the parametric search of metadata entries associated with an object and offers the ability to search the content of stored objects. When a text or image object is stored, indexing information can be created; and IBM DB2 Digital Library provides a rich portfolio of search technology for text and image objects. For example, users can query by keyword or Boolean text search, or by image textures and shapes; and they can combine the keyword, text, and image using the multi-search capability. They can express queries in natural language, and the searches return a list of ranked results.

## Distribution

Multiple communication techniques on various platforms, including TCP/IP and SNA, are supported. IBM has extensive advanced networking capabilities with Asynchronous Transfer Mode (ATM) switches and network management software to assist in digital and analog information delivery, including real-time audio and video delivery. IBM DB2 Digital Library Version 2 supports CORBA, the OMG standard.

## Rights Management

IBM DB2 Digital Library rights management functions control access and help prevent the unauthorized use of intellectual property content. IBM DB2 Digital Library offers the industry's leading rights management technology for authentication, encryption, billing, and payment systems.

IBM DB2 Digital Library is a technology platform for a wide variety of solution offerings including:

- **IBM Media Director** - Integrates with digital audio workstations to provide audio professionals with network access to, and advanced management for, more than 100,000 hours of audio files.
- **Imagine Products' The Executive Producer** - is a full-function video logging and archiving system with automatic scene detection.
- **IBM Media Management System** - an integrated Web-based solution for the automated storage and retrieval of video stock footage, audio, still images and film scripts.
- **IBM DB2 Digital Library Collection Treasury** - enables cultural institutions to provide online access to valuable original holdings while managing appropriate restrictions on audience access and the reuse of images.

## Search & Access

*Introducing instant gratification for your brain*

Dewey's greatest invention, the decimal system, was something we all learned in elementary school. Now most libraries use the Library of Congress cataloging system. But mining for information through the mixed-media objects in a digital library requires yet another new way of looking at things. Catalog systems only point library users to where the information is located. But IBM DB2 Digital Library uses powerful search and access technologies that help users look at the content to find what they want quickly, accurately and intuitively.

IBM DB2 Digital Library solutions provide content-independent data storage that allows for many kinds of objects to be stored in a scalable archive. Many kinds of media objects that a user wants to access are categorized differently in a manner that's appropriate for each object type. For example, a book can be categorized by title, author or subject. A movie can be categorized by producer, director or theme. If a user is looking for a certain object type, a parametric search looks for metadata entries like author, subject, title, length and the like.

Conventional technology only allows a user to query by keyword, which sends back a list of entries containing that word in its index. IBM's rich portfolio of search technology includes sophisticated tools for text and image analysis. IBM DB2 Digital Library offers natural language query—permitting users to express queries in simple, natural style without concern for exact word positioning. This type of query returns a ranked list, with highest probability of relevance at the top of the list. Textual analysis of words is also performed; for instance, a distinction is made between "White House" and "white house", yet an association is recognized between "IBM" and "International Business Machines Corporation".

The above text mining functions are augmented with further content-based search capabilities, providing tools such as clustering and abstracting techniques for organizing information.

Since an array of multimedia is typically found in a digital library collection, users need to search using more than just language. Query By Image Content (QBIC), IBM's award winning image search technology, allows users to search a collection's media objects by color percentage, distribution, position and image texture expressed graphically, for example, by specifying colors from a color palette or selecting textures from a display of sample images. IBM DB2 Digital Library technology is expanding to include video searching by moving image content.

What's important to remember is that IBM DB2 Digital Library is open. The actual make-up of one digital library can be quite different from another (as you'll see in our Case Studies). The search and access power "under the hood" of IBM DB2 Digital Library enables content authors, editors, scholars, users and curiosity seekers to extract the information they need.

Where Search & Access leaves off, the Distribution of digital library materials across both Internet and networks begins.

## Distribution

### *IBM DB2 Digital Library Is Open To The World*

Because IBM DB2 Digital Library can provide access to users through any existing computer network, the audience for information is finally, truly global. IBM DB2 Digital Library is open and its content can be distributed directly to users via private networks, your intranet, the World Wide Web or interactive TV. This capability represents IBM's commitment to e-business computing, for worldwide information and data exchange.

For many IBM DB2 Digital Library solutions, the IBM Global Network provides a secure, reliable medium for distribution and access to a collection. However, the flexibility of IBM DB2 Digital Library means you will not be locked into any single distribution medium. And, the distributed information can be viewed and presented using any computer system with a graphical user interface.

Digitized content, such as images, audio and video, is large in size relative to many existing network capabilities. Moreover, real-time delivery of audio and video is dependant on a network that can assure paced and continuous delivery. IBM has developed extensive advanced networking capabilities, such as Asynchronous Transfer Mode (ATM) switches and network management software, to assist in digital and analog information delivery.

IBM and Indiana University School of Music's Variations Project has IBM DB2 Digital Library server, network and client technologies to distribute continuous, compact-disc quality digital audio over a network without audio breakup.

Whether a digital library resides on a private or public network, a central issue (perhaps the *key* issue) is control of Rights Management.

## Rights Management

*New technologies bring new opportunities, but not without risk*

The definition of content ownership is not universal. Copyrights may be protected in one country and practically ignored in the next. So how do you protect your intellectual property rights in a digital library that anyone with a PC can learn to use in a few minutes? Rights Management is the answer. IBM has concentrated on Rights Management as a key factor in creating IBM Digital Library and allowing you to develop a full digital library solution to meet your business needs.

The challenge is to provide ease of use, privacy, content integrity and cost utility for users while establishing bulletproof Rights Management solutions for content owners. To meet that challenge, IBM DB2 Digital Library incorporates the rich legacy of IBM's innovations in networking security and transactions technology.

### Innovation At Work

Compare using a IBM DB2 Digital Library to making a withdrawal from an automated banking machine. A user is identified, enters a password, requests information or an object, and the system checks the request against the user's eligibility. Upon approval the requested objects can be watermarked to deter illegal duplication. And the entire process is conducted in a secure environment without the threat of intrusion. Meanwhile, compensation for the value added to the information or object is duly processed.

### Signed, Sealed, Delivered

IBM DB2 Digital Library can authenticate original media -- photos, manuscripts, audio, video, film and images -- by using electronic signatures. Digital content can be recognized as authentic with these signatures. Watermarks, a form of electronic signature currently in use throughout several IBM DB2 Digital Library solutions, are encoded onto photos, films, images and manuscripts. Visible watermarks can be graphically representative of a content owner's identity, like a logo or crest. Watermarks are sophisticated identifiers that inhibit the misappropriation of content owners' assets while assuring users' confidence in the authenticity of the content.

IBM's e-business Cryptolope Live! product represents a giant leap forward in distribution for both content owners and users. The Cryptolope an encryption-protected "envelope" that can travel on public networks.

Anybody who wants to open a Cryptolope to read its contents must use a key to unlock it. Users can preview a Cryptolope's contents, then decide whether to pay for the key. For sensitive content needing increased security, a Cryptolope may require several keys. And a Cryptolope can travel on networks with only the intended recipient being aware of its presence. All the while, the IBM e-business service keeps impeccable records of rights payments transacted.

IBM DB2 Digital Library relies on Cryptolope technology for its Rights Management capabilities. With multimedia assets, the work of several content authors is contained within a single media object. For instance, a digitized document might contain a photo, an illustration, a page of text and some music--each authored by a different person who should be compensated. Furthermore, a customer accessing this document might not be required to purchase the entire work, but rather just the individual section that is accessed. Cryptolope technology, the cornerstone of IBM DB2 Digital Library strategy for Rights Management, offers discreet recognition for each content author, keeping track of who gets paid for what. More information on IBM Cryptolope Live! is available online.

IBM DB2 Digital Library provides trusted means for protecting and managing the rights of content owners. Rights Management issues impacts every aspect of IBM DB2 Digital Library -- Create &

## Storage & Management

*What to do when too much is never enough*

The conversion from paper, tape and film to bits and bytes saves masses of physical space, it's true. But there remains a price to be paid in storage capacity and performance. IBM DB2 Digital Library provides high-performance, scalable storage and management of information in an open environment, across a broad spectrum of platforms.

The key to effectively storing and managing information — especially massive amounts of multimedia data — is the enrichment of the digitized objects so that they can be efficiently organized for search. IBM DB2 Digital Library's information management features include automated indexing, foldering, correlation, feature extraction and translation functions.

Two other key features of IBM DB2 Digital Library are openness and scalability. IBM Digital Library is an open framework of hardware and software which can be implemented across the full range of platforms, including NT, AIX and OS/390. And IBM DB2 Digital Library provides a powerful and scalable technology base that will grow easily as needs grow—to see projects through from initial production to full-scale implementation.

Drawing from IBM's legacy of managing information, IBM DB2 Digital Library has developed a unique architecture for managing the storage of objects. At the core of the IBM DB2 Digital Library storage and management infrastructure is a library server which manages catalog information and provides pointers to the objects held in the collection. Object servers contain the actual digitized content files of a digital library, such as a video clip. The client (or end user) receives a direct path to the information requested from the collection while the data contained in the digital library is protected from random user access. With this triangle architecture the library server prevents unauthorized people from getting to the object servers. The data for digitized images, music and video tends to be large. Storing frequently used objects close to their users reduces communication costs and improves performance since the number of times the object is relayed is minimized.

In an IBM DB2 Digital Library solution, objects may be prestored and retrieved upon request. IBM DB2 Digital Library solutions provides an open set of application interfaces for access to servers, interaction with servers and the delivery of objects to clients. Objects can be delivered directly to a client so that a file is placed on a workstation ready for reuse. In addition, objects can be delivered and launched at the client level, so that, for example, a text object that's delivered in WordPerfect format is activated in WordPerfect on the user's desktop. Likewise, a graphical image in Lotus Freelance can be activated in Lotus Freelance on the user's desktop.

IBM DB2 Digital Library provides for hierarchical storage management. Digital objects can be stored where people want them. High profile objects that are most likely to be accessed often may be stored on spinning disk, while objects less likely to be accessed are migrated off to tape or optical storage. The result is cost savings in storage maintenance. IBM DB2 Digital Library is open to a wide range of storage devices to ensure delivery of information on demand.

The cost of converting source materials into digital information means the storage architecture of IBM DB2 Digital Library must withstand the rigors of time and continuous use. Only IBM can boast the legacy of reliability and system stability that all digital libraries need to insure against the catastrophe that any breakdown would surely cause.

After defining the scope of a digital library, you should consider the Search & Access functions that allow users to quickly and conveniently find the information they need.

## ***IBM DB2 Digital Library at a Glance***

### **Hardware Requirements**

- Minimum RAM
  - 32 MB for AIX, Windows 95, and Windows NT clients
  - 32 MB for IRIX clients
  - 32 MB for Windows NT servers
  - 32 MB for AIX server
- Minimum hard disk space: 60MB
- CD-ROM drive: For installation only
- LAN support: IBM Token Ring or Ethernet
- Optical, Tape Library, RAID or other storage devices as required for use with the Object Servers

### **Software Requirements**

#### **AIX LIBRARY AND OBJECT SERVERS**

- AIX Version 4.2.1
- DB2/6000 2.1.1 or Oracle/Unix 7.3
- C Set++ for AIX 3.1.3 (for Library Server only)
- For Object Server auxiliary device support only: ADSM for AIX Client Version 2.1

#### **WINDOWS NT LIBRARY AND OBJECT SERVERS**

- Windows NT Server 4.0
- DB2 for Windows NT 2.1.2 or Oracle for Windows NT 7.3
- Microsoft Visual C++ 4.2 (for Library Server only)
- For Object Server auxiliary device support only: ADSM Client Version 2.1, mod level 6

#### **CLIENTS**

- AIX Version 4.2
- Windows 95 or Windows NT Workstation 4.0

- Macintosh System 7.5.3 or higher
- IRIX 5.3

#### COMMUNICATIONS

- For AIX Library and Object Servers, either AIX SNA Server/6000 2.1, or TCP/IP as installed with the operating system
- For Macintosh Client, TCP/IP Configuration using Open Transport V1.1
- For all other clients and servers, TCP/IP as installed from the operating system

#### APPLICATION DEVELOPMENT:

C Set++ for AIX 3.1.3, Microsoft Visual C++ 4.2, Microsoft Visual Basic 4.0, Metrowerks CodeWarrior Professional Release 1, IRIX Development Option (C compiler), or Java Development Kit 1.1 as appropriate for the development environment.

A WEB BROWSER : enabled for JDK 1.1, such as Netscape Navigator Version 3.0 or Microsoft Internet Explorer.

For more detailed information, see the IBM DB2 Digital Library Planning and Installation Guide (GC26-8623) which can be ordered from IBM.

#### PRODUCT PACKAGING

The IBM DB2 Digital Library Version 2 Program Package permits one installation each of the Library Server, Object Server, Software Developers Kit, and Concurrent User. Additional installations of these items, plus installation of the Media Manager, and the Text and Image Servers, are available as optional separately priced features.

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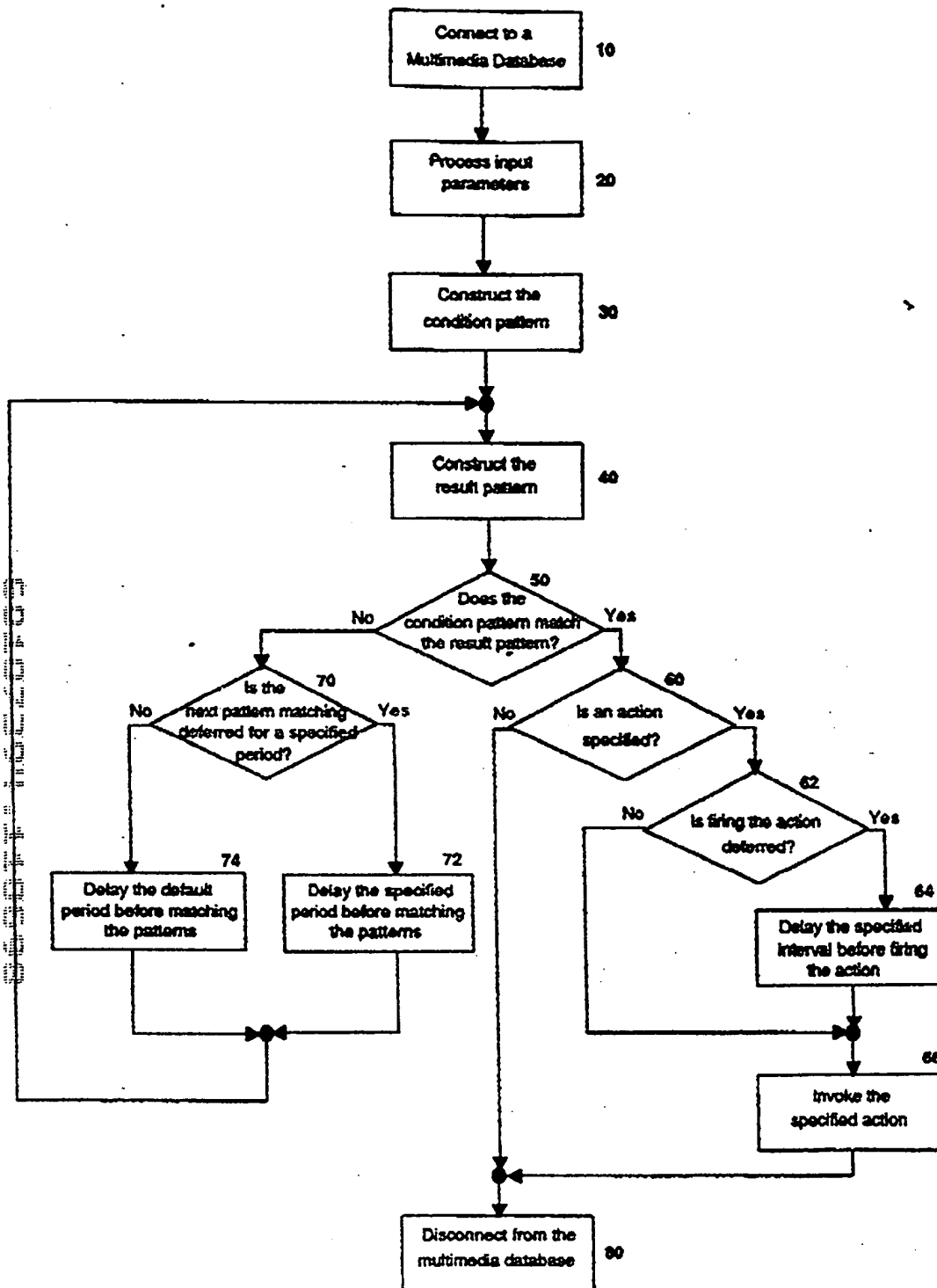


Figure 1. A workflow agent procedure



930307-100000

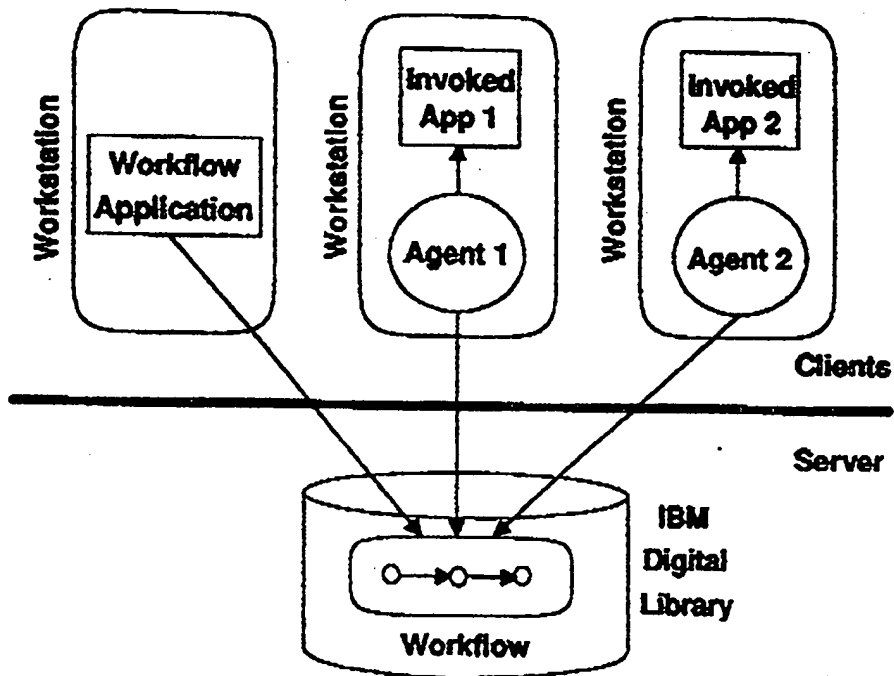


Figure 2. Workflow agents in a client/server environment

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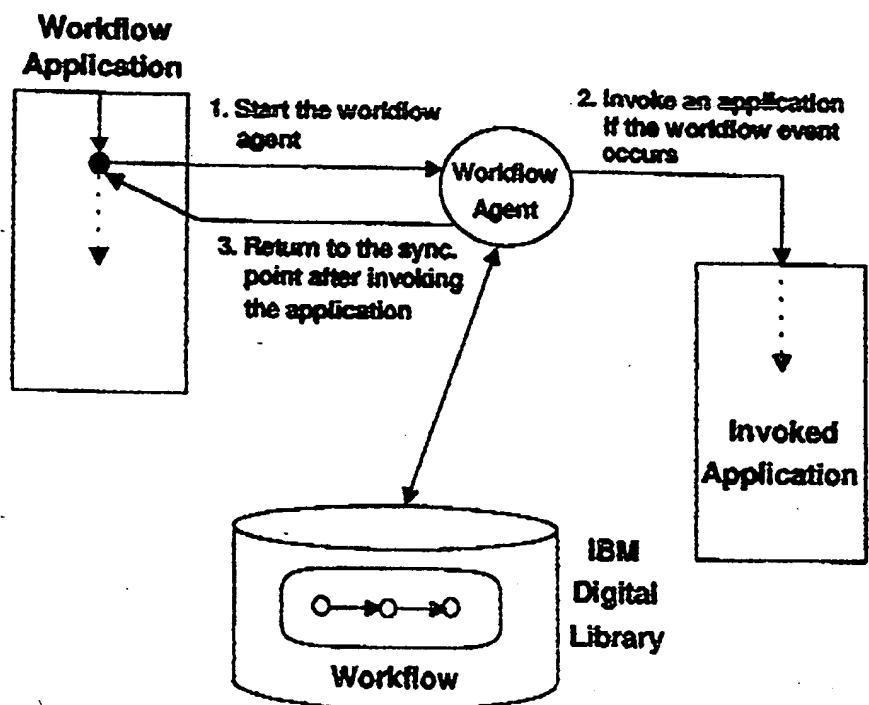


Figure 4. Scenario 2

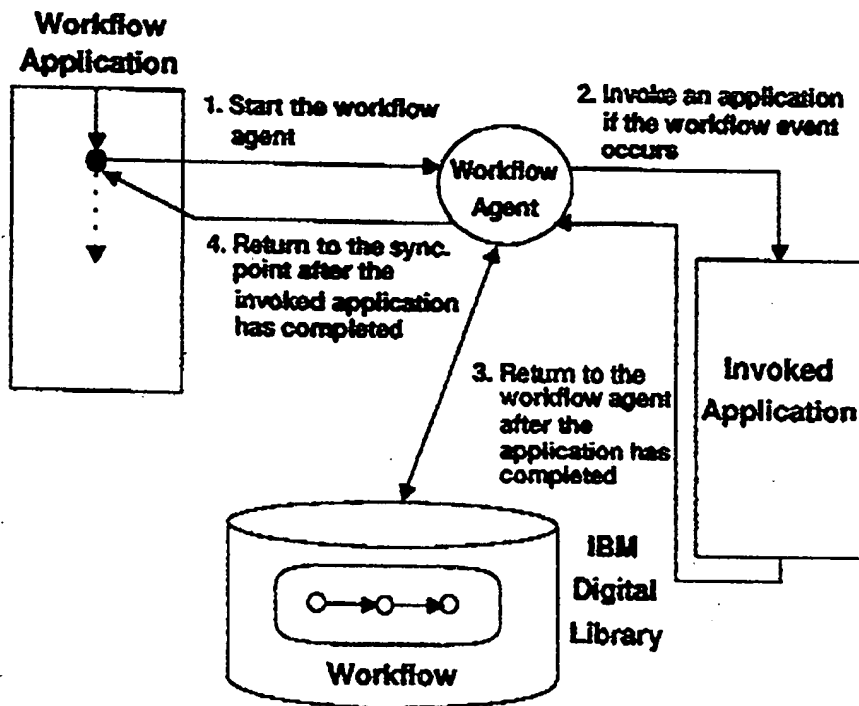


Figure 5. Scenario 3

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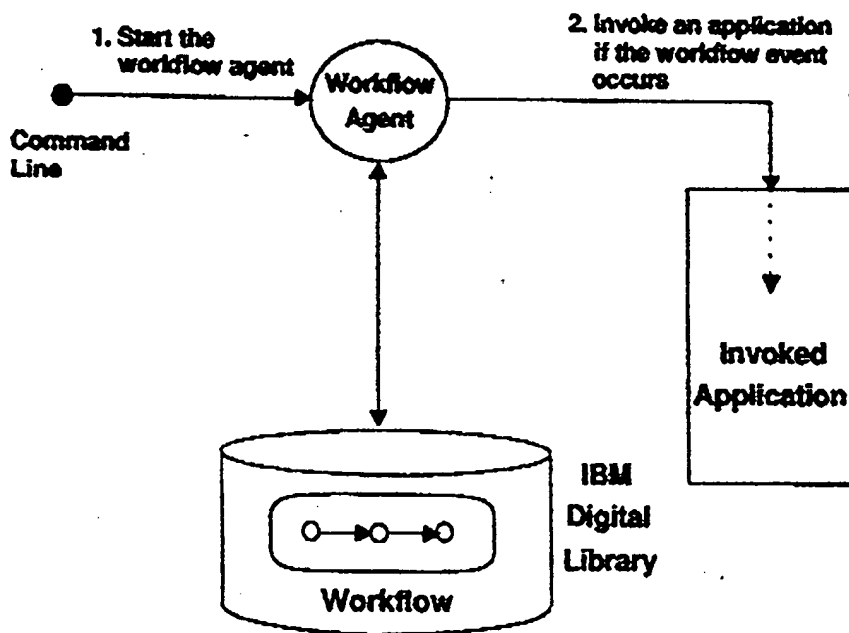


Figure 6. Scenario 4

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